

# NOTES 15: MORE ON TESTING

Stat 120 | Fall 2025

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$H_0$ True	$H_0$ False
Reject $H_0$	
Do not reject $H_0$	

## Type I Error

Rejecting  $H_0$  when  $H_0$  is true

## Type II Error

Failing to reject  $H_0$  when  $H_0$  is false

## $\alpha$ (Significance Level)

The probability of making a Type I error is  $\alpha$  (which we get to decide.)

## $\beta$

The probability of making a Type II error

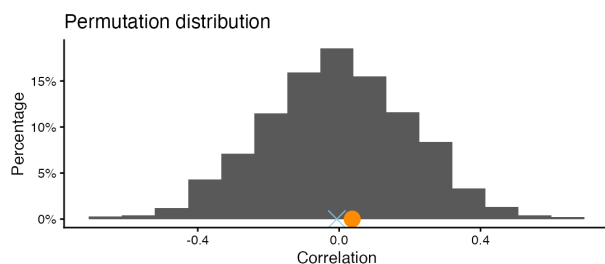
## Power

The probability of rejecting  $H_0$  when  $H_0$  is true. (High power = good, low power = bad). Equal to  $1 - \beta$

**Example:** A public health researcher believes that there is a positive relationship between heart rate and age among ICU patients. Data from 23 patients gives  $r = 0.037$ . Do you think the probability of a Type II error is higher if  $\rho = .9$  or  $\rho = .1$ ?

$$H_0 : \rho = 0$$

$$H_A : \rho > 0$$



## Big Picture Picture

Sampling Distribution

Bootstrap Distribution

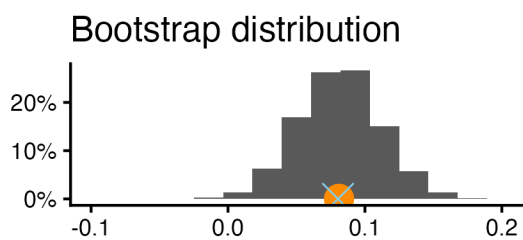
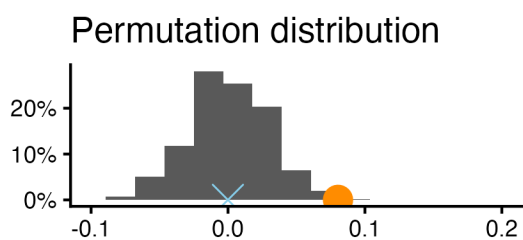
Null Distribution

## Connection to Confidence Intervals

If the value of  $H_0$  is *outside* of the confidence interval, we \_\_\_\_\_.

If the value of  $H_0$  is *inside* the confidence interval, we \_\_\_\_\_.

**Illustration:** (Social Media Poll Example)



# 1 Statistical vs Practical Significance

**Example:** Breaking news! I have a proven way to improve your exam scores! The difference in Exam 02 scores between students who do this and students who don't is statistically significant! All you have to do is come to every office hour, read each chapter of the textbook 5 times, and do every single problem in the book.

Parameter:

Sample Statistic:

## Statistical vs Practical Significance

When making conclusions, it's important to consider **effect size** alongside *statistical significance*